



SEQUENCE LISTING

<110> Habener, Joel
Zulewski, Hendrik
Abraham, Elizabeth
vallejo, Mario

<120> STEM CELLS OF THE ISLETS OF LANGERHANS AND THEIR USE

<130> 17633/1230

<140> US 09/731,261

<141> 2000-12-06

<150> US 60/169,082

<151> 1999-12-06

<150> US 60/215,109

<151> 2000-06-28

<150> US 60/239,880

<151> 2000-10-06

<160> 55

<170> PatentIn version 3.1

<210> 1

<211> 4854

<212> DNA

<213> Homo sapiens

<400> 1

```
atggagggct gcatggggga ggagtcgttt cagatgtggg agctcaatcg ggccttgag 60
gcctacctgg gccgggtcaa ggcgctggag gagcagaatg agctgctcag cgccggactc 120
ggggggctcc ggcgacaatc cgcgacacc tcctggcggg cgcagccga cgacgagctg 180
gcggccctgc gtgcgtcgt tgaccaacgc tggcgggaga agcacgcggc cgaggtggcg 240
cgcgacaacc tggctgaaga gctggagggc gtggcaggcc gatgcgagca gctgcggctg 300
gcccgggagc ggacgacgga ggaggtagcc cgcaaccggc gcgccgtcga ggcagagaaa 360
tgcgcccggg cctggctgag tagccagggg gcagagctgg agcgcgagct agaggctcta 420
cgcgtggcgc acgaggagga gcgcgtcggg ctgaacgcgc aggctgcctg tgccccccgc 480
ctgcccgcgc cgccccggcc tcccgcgccg gccccggagg tagaggagct ggcaaggcga 540
ctgggcgagg cgtggcgcgg ggcagtgcgc ggctaccagg agcgcgtggc acacatggag 600
acgtcgttg accagaccg cgagcgcctg gcccgggagg tgcaggggtg ccgagaggtc 660
cgcttgagc tgcagcagct ccaggctgag cgcgagggcc tcctggagcg cagggcagcg 720
ttggaacaga ggttgagggg ccgctggcag gagcggctgc gggctactga aaagtccag 780
ctggctgtgg aggccctgga gcaggagaaa cagggcctac agagccagat cgctcaggtc 840
ctggaaggtc ggcagcagct ggcgcacctc aagatgtccc tcagcctgga ggtggccacg 900
tacaggaccc tcctggaggc tgagaactcc cggctgcaaa cacctggcgg tggctccaag 960
```

acttcctca	gctttcagga	ccccaagctg	gagctgcaat	tccctaggac	cccagagggc	1020
cggcgtcttg	gatctttgct	cccagtcctg	agcccaactt	ccctcccctc	acccttgcct	1080
gctacccttg	agacacctgt	gccagccttt	cttaagaacc	aagaattcct	ccaggcccgt	1140
acccttacct	tggccagcac	ccccatcccc	cccacacctc	aggcacctc	tcctgctgta	1200
gatgcagaga	tcagagccca	ggatgctcct	ctctctctgc	tccagacaca	gggtgggagg	1260
aaacaggctc	cagagcccct	gcgggctgaa	gccaggggtg	ccattcctgc	cagcgtcctg	1320
cctggaccag	aggagcctgg	gggccagcgg	caagaggcca	gtacaggcca	gtccccagag	1380
gaccatgcct	ccttggcacc	acccttcagc	cctgaccact	ccagtttaga	ggctaaggat	1440
ggagaatccg	gtgggtctag	agtgttcagc	atatgccgag	gggaagggtga	agggcaaadc	1500
tgggggttg	tagagaaaga	aacagccata	gagggcaaag	tggttaagcag	cttgacgacg	1560
gaaatatggg	aagaagagga	tctaaacagg	aaggaaatcc	aggactccca	ggttcctttg	1620
gaaaaagaaa	ccctgaagtc	tctgggagag	gagattcaag	agtcactgaa	gactctggaa	1680
aaccagagcc	atgagacact	agaaaggag	aatcaagaat	gtccgagggtc	tttagaagaa	1740
gacttagaaa	cactaaaaag	tctagaaaag	gaaaataaaa	gagctattaa	aggatgtgga	1800
ggtagtgaga	cctctagaaa	aagaggctgt	aggcaactta	agcctacagg	aaaagaggac	1860
acacagacat	tgcaatccct	gcaaaaggag	aatcaagaac	taatgaaatc	tcttgaaggt	1920
aatctagaga	catttttatt	tccaggaacg	gaaaatcaag	aattagtaag	ttctctgcaa	1980
gagaacttag	agtcattgac	agctctggaa	aaggagaatc	aagagccact	gagatctcca	2040
gaagtagggg	atgaggaggc	actgagacct	ctgacaaagg	agaatcagga	acccttgagg	2100
tctcttgaag	atgagaacaa	agaggccttt	agatctctag	aaaaagagaa	ccaggagcca	2160
ctgaagactc	tagaagaaga	ggaccagagt	attgtgagac	ctctagaaac	agagaatcac	2220
aaatcactga	ggtctttaga	agaacaggac	caagagacat	tgagaactct	tgaaaaagag	2280
actcaacagc	gacggagggtc	tctaggggaa	caggatcaga	tgacattaag	accccagaa	2340
aaagtggatc	tagaaccact	gaagtctctt	gaccaggaga	tagctagacc	tcttgaaaat	2400
gagaatcaag	agttctttaa	gtcactcaaa	gaagagagcg	tagaggcagt	aaaatcttta	2460
gaaacagaga	tcctagaatc	actgaagtct	gcgggacaag	agaacctgga	aacactgaaa	2520
tctccagaaa	ctcaagcacc	actgtggact	ccagaagaaa	taaataaatc	agggggcaat	2580
gaatcctcta	gaaaaggaaa	ttcaagaacc	actggagtct	gtggaagtga	accaagagac	2640
attcagactc	ctggaagagg	agaatcagga	atcattgaga	tctctgggag	catggaacct	2700
ggagaatttg	agatctccag	aggagtagac	aaggaaagtc	aaaggaatct	ggaagaggaa	2760
gagaacctgg	gaaagggaga	gtaccaagag	tcactgaggt	ctctggagga	ggagggacag	2820
gagctgccgc	agtctgcaga	tgtgcagagg	tgggaagata	cgggtggagaa	ggaccaagaa	2880

ctggctcagg	aaagccctcc	tgggatggct	ggagtggaaa	ataaggatga	ggcagagctg	2940
aatctaaggg	agcaggatgg	cttcaactggg	aaggaggagg	tggtagagca	gggagagctg	3000
aatgccacag	aggaggtctg	gttcccaggc	gaggggcacc	cagagaaccc	tgagcccaaa	3060
gagcagagag	gcctggttga	gggagccagt	gtgaagggag	gggctgaggg	cctccaggac	3120
cctgaagggc	aatcacaaca	ggtggggacc	ccaggcctcc	aggctcccca	ggggctgcca	3180
gaggcgatag	agcccctggt	ggaagatgat	gtggccccag	ggggtgacca	agcctcccca	3240
gaggatcatgt	tggggtcaga	gcctgccatg	ggtgagtctg	ctgcgggagc	tgagccaggc	3300
ctggggcagg	gggtgggagg	gctgggggac	ccaggccatc	tgaccaggga	agaggtgatg	3360
gaaccacccc	tgggaagagga	gagtttggag	gcaaagaggg	ttcaggggctt	ggaagggcct	3420
agaaaggacc	tagaggaggc	aggtggtctg	gggacagagt	tctccgagct	gcctgggaag	3480
agcagagacc	cttgggagcc	tcccagggag	ggtaggagg	agtcagaggc	tgaggccccc	3540
aggggagcag	aggaggcggt	ccctgctgag	accctgggcc	acactggaag	tgatgccctt	3600
tcaccttggc	ctctggggtc	agaggaagct	gaggaggatg	taccaccagt	gctggtctcc	3660
cccagcccaa	cgtacacccc	gaccttgga	gatgcccctg	ggctccagcc	tcaggctgaa	3720
gggagtcagg	aggctagctg	gggggtgcag	gggagggctg	aagctgggaa	agtagagagc	3780
gagcaggagg	agttgggttc	tggggagatc	cccaggggcc	tccaggagga	aggggaggag	3840
agcagagaag	agagcgagga	ggatgagctc	ggggagaccc	ttccagactc	cactcccctg	3900
ggcttctacc	tcagggtccc	cacctcccc	aggtggaccc	cactggagag	cagaggccac	3960
cccctcaagg	agactggaaa	ggagggctgg	gacctgctg	tcctggcttc	cgagggcctt	4020
gaggaaccct	cagaaaagga	ggagggggag	gagggagaag	aggagtgtgg	ccgtgactct	4080
gacctgtcag	aagaatttga	ggacctgggg	actgaggcac	cttttcttcc	tggggtccct	4140
ggggaggtgg	cagaacctct	gggccagggt	ccccagctgc	tactggatcc	tgcagcctgg	4200
gatcgagatg	gggagtctga	tgggtttgca	gatgaggaag	aaagtgggga	ggagggagag	4260
gaggatcagg	aggaggggag	ggagccaggg	gctgggcggg	gggggcccagg	gtcttctgtt	4320
ggcagcctcc	aggccctgag	tagctcccag	agaggggaat	tcctggagtc	tgattctgta	4380
agtgtcagcg	tcccctggga	tgacagcttg	aggggtgcag	tggctggtgc	ccccagact	4440
gccctggaaa	cggagtccca	ggacagtgtc	gagccttctg	gctcagagga	agagtctgac	4500
cctgtttcct	tggagagggga	ggacaaagtc	cctggccctc	tagagatccc	cagtgggatg	4560
gaggatgcag	gcccaggggc	agacatcatt	ggtgttaatg	gccaggggcc	caacttgag	4620
gggaagtcac	agcatgtaaa	tgggggagta	atgaacgggc	tggagcagtc	tgaggaaagt	4680
ggggcaagga	atgcgctagt	ctctgagggga	gaccgagggga	gcccctttca	ggaggaggag	4740
gggagtgtc	tgaagaggtc	ttcggcaggg	gctcctgttc	acctgggcca	gggtcagttc	4800

ctgaagttca ctcagagggga aggagataga gagtcctggt cctcagggga ggac

4854

<210> 2
<211> 1618
<212> PRT
<213> Homo sapiens

<400> 2

Met Glu Gly Cys Met Gly Glu Glu Ser Phe Gln Met Trp Glu Leu Asn
1 5 10 15

Arg Arg Leu Glu Ala Tyr Leu Gly Arg Val Lys Ala Leu Glu Glu Gln
20 25 30

Asn Glu Leu Leu Ser Ala Gly Leu Gly Gly Leu Arg Arg Gln Ser Ala
35 40 45

Asp Thr Ser Trp Arg Ala His Ala Asp Asp Glu Leu Ala Ala Leu Arg
50 55 60

Ala Leu Val Asp Gln Arg Trp Arg Glu Lys His Ala Ala Glu Val Ala
65 70 75 80

Arg Asp Asn Leu Ala Glu Glu Leu Glu Gly Val Ala Gly Arg Cys Glu
85 90 95

Gln Leu Arg Leu Ala Arg Glu Arg Thr Thr Glu Glu Val Ala Arg Asn
100 105 110

Arg Arg Ala Val Glu Ala Glu Lys Cys Ala Arg Ala Trp Leu Ser Ser
115 120 125

Gln Gly Ala Glu Leu Glu Arg Glu Leu Glu Ala Leu Arg Val Ala His
130 135 140

Glu Glu Glu Arg Val Gly Leu Asn Ala Gln Ala Ala Cys Ala Pro Arg
145 150 155 160

Leu Pro Ala Pro Pro Arg Pro Pro Ala Pro Ala Pro Glu Val Glu Glu
165 170 175

Leu Ala Arg Arg Leu Gly Glu Ala Trp Arg Gly Ala Val Arg Gly Tyr
180 185 190

Gln Glu Arg Val Ala His Met Glu Thr Ser Leu Asp Gln Thr Arg Glu
195 200 205

Arg Leu Ala Arg Ala Val Gln Gly Ala Arg Glu Val Arg Leu Glu Leu

210

215

220

Gln Gln Leu Gln Ala Glu Arg Gly Gly Leu Leu Glu Arg Arg Ala Ala
 225 230 235 240

Leu Glu Gln Arg Leu Glu Gly Arg Trp Gln Glu Arg Leu Arg Ala Thr
 245 250 255

Glu Lys Phe Gln Leu Ala Val Glu Ala Leu Glu Gln Glu Lys Gln Gly
 260 265 270

Leu Gln Ser Gln Ile Ala Gln Val Leu Glu Gly Arg Gln Gln Leu Ala
 275 280 285

His Leu Lys Met Ser Leu Ser Leu Glu Val Ala Thr Tyr Arg Thr Leu
 290 295 300

Leu Glu Ala Glu Asn Ser Arg Leu Gln Thr Pro Gly Gly Gly Ser Lys
 305 310 315 320

Thr Ser Leu Ser Phe Gln Asp Pro Lys Leu Glu Leu Gln Phe Pro Arg
 325 330 335

Thr Pro Glu Gly Arg Arg Leu Gly Ser Leu Leu Pro Val Leu Ser Pro
 340 345 350

Thr Ser Leu Pro Ser Pro Leu Pro Ala Thr Leu Glu Thr Pro Val Pro
 355 360 365

Ala Phe Leu Lys Asn Gln Glu Phe Leu Gln Ala Arg Thr Pro Thr Leu
 370 375 380

Ala Ser Thr Pro Ile Pro Pro Thr Pro Gln Ala Pro Ser Pro Ala Val
 385 390 395 400

Asp Ala Glu Ile Arg Ala Gln Asp Ala Pro Leu Ser Leu Leu Gln Thr
 405 410 415

Gln Gly Gly Arg Lys Gln Ala Pro Glu Pro Leu Arg Ala Glu Ala Arg
 420 425 430

Val Ala Ile Pro Ala Ser Val Leu Pro Gly Pro Glu Glu Pro Gly Gly
 435 440 445

Gln Arg Gln Glu Ala Ser Thr Gly Gln Ser Pro Glu Asp His Ala Ser
 450 455 460

Leu Ala Pro Pro Leu Ser Pro Asp His Ser Ser Leu Glu Ala Lys Asp
 Page 5

465 470 475 480

Gly Glu Ser Gly Gly Ser Arg Val Phe Ser Ile Cys Arg Gly Glu Gly
485 490 495

Glu Gly Gln Ile Trp Gly Leu Val Glu Lys Glu Thr Ala Ile Glu Gly
500 505 510

Lys Val Val Ser Ser Leu Gln Gln Glu Ile Trp Glu Glu Glu Asp Leu
515 520 525

Asn Arg Lys Glu Ile Gln Asp Ser Gln Val Pro Leu Glu Lys Glu Thr
530 535 540

Leu Lys Ser Leu Gly Glu Glu Ile Gln Glu Ser Leu Lys Thr Leu Glu
545 550 555 560

Asn Gln Ser His Glu Thr Leu Glu Arg Glu Asn Gln Glu Cys Pro Arg
565 570 575

Ser Leu Glu Glu Asp Leu Glu Thr Leu Lys Ser Leu Glu Lys Glu Asn
580 585 590

Lys Arg Ala Ile Lys Gly Cys Gly Gly Ser Glu Thr Ser Arg Lys Arg
595 600 605

Gly Cys Arg Gln Leu Lys Pro Thr Gly Lys Glu Asp Thr Gln Thr Leu
610 615 620

Gln Ser Leu Gln Lys Glu Asn Gln Glu Leu Met Lys Ser Leu Glu Gly
625 630 635 640

Asn Leu Glu Thr Phe Leu Phe Pro Gly Thr Glu Asn Gln Glu Leu Val
645 650 655

Ser Ser Leu Gln Glu Asn Leu Glu Ser Leu Thr Ala Leu Glu Lys Glu
660 665 670

Asn Gln Glu Pro Leu Arg Ser Pro Glu Val Gly Asp Glu Glu Ala Leu
675 680 685

Arg Pro Leu Thr Lys Glu Asn Gln Glu Pro Leu Arg Ser Leu Glu Asp
690 695 700

Glu Asn Lys Glu Ala Phe Arg Ser Leu Glu Lys Glu Asn Gln Glu Pro
705 710 715 720

Leu Lys Thr Leu Glu Glu Glu Asp Gln Ser Ile Val Arg Pro Leu Glu
Page 6

725

730

735

Thr Glu Asn His Lys Ser Leu Arg Ser Leu Glu Glu Gln Asp Gln Glu
740 745 750

Thr Leu Arg Thr Leu Glu Lys Glu Thr Gln Gln Arg Arg Arg Ser Leu
755 760 765

Gly Glu Gln Asp Gln Met Thr Leu Arg Pro Pro Glu Lys Val Asp Leu
770 775 780

Glu Pro Leu Lys Ser Leu Asp Gln Glu Ile Ala Arg Pro Leu Glu Asn
785 790 795 800

Glu Asn Gln Glu Phe Leu Lys Ser Leu Lys Glu Glu Ser Val Glu Ala
805 810 815

Val Lys Ser Leu Glu Thr Glu Ile Leu Glu Ser Leu Lys Ser Ala Gly
820 825 830

Gln Glu Asn Leu Glu Thr Leu Lys Ser Pro Glu Thr Gln Ala Pro Leu
835 840 845

Trp Thr Pro Glu Glu Ile Asn Lys Ser Gly Gly Asn Glu Ser Ser Arg
850 855 860

Lys Gly Asn Ser Arg Thr Thr Gly Val Cys Gly Ser Glu Pro Arg Asp
865 870 875 880

Ile Gln Thr Pro Gly Arg Gly Glu Ser Gly Ile Ile Glu Ile Ser Gly
885 890 895

Ser Met Glu Pro Gly Glu Phe Glu Ile Ser Arg Gly Val Asp Lys Glu
900 905 910

Ser Gln Arg Asn Leu Glu Glu Glu Glu Asn Leu Gly Lys Gly Glu Tyr
915 920 925

Gln Glu Ser Leu Arg Ser Leu Glu Glu Glu Gly Gln Glu Leu Pro Gln
930 935 940

Ser Ala Asp Val Gln Arg Trp Glu Asp Thr Val Glu Lys Asp Gln Glu
945 950 955 960

Leu Ala Gln Glu Ser Pro Pro Gly Met Ala Gly Val Glu Asn Lys Asp
965 970 975

Glu Ala Glu Leu Asn Leu Arg Glu Gln Asp Gly Phe Thr Gly Lys Glu
Page 7

980

985

990

Glu Val Val Glu Gln Gly Glu Leu Asn Ala Thr Glu Glu Val Trp Phe
 995 1000 1005

Pro Gly Glu Gly His Pro Glu Asn Pro Glu Pro Lys Glu Gln Arg
 1010 1015 1020

Gly Leu Val Glu Gly Ala Ser Val Lys Gly Gly Ala Glu Gly Leu
 1025 1030 1035

Gln Asp Pro Glu Gly Gln Ser Gln Gln Val Gly Thr Pro Gly Leu
 1040 1045 1050

Gln Ala Pro Gln Gly Leu Pro Glu Ala Ile Glu Pro Leu Val Glu
 1055 1060 1065

Asp Asp Val Ala Pro Gly Gly Asp Gln Ala Ser Pro Glu Val Met
 1070 1075 1080

Leu Gly Ser Glu Pro Ala Met Gly Glu Ser Ala Ala Gly Ala Glu
 1085 1090 1095

Pro Gly Leu Gly Gln Gly Val Gly Gly Leu Gly Asp Pro Gly His
 1100 1105 1110

Leu Thr Arg Glu Glu Val Met Glu Pro Pro Leu Glu Glu Glu Ser
 1115 1120 1125

Leu Glu Ala Lys Arg Val Gln Gly Leu Glu Gly Pro Arg Lys Asp
 1130 1135 1140

Leu Glu Glu Ala Gly Gly Leu Gly Thr Glu Phe Ser Glu Leu Pro
 1145 1150 1155

Gly Lys Ser Arg Asp Pro Trp Glu Pro Pro Arg Glu Gly Arg Glu
 1160 1165 1170

Glu Ser Glu Ala Glu Ala Pro Arg Gly Ala Glu Glu Ala Phe Pro
 1175 1180 1185

Ala Glu Thr Leu Gly His Thr Gly Ser Asp Ala Pro Ser Pro Trp
 1190 1195 1200

Pro Leu Gly Ser Glu Glu Ala Glu Glu Asp Val Pro Pro Val Leu
 1205 1210 1215

Val Ser Pro Ser Pro Thr Tyr Thr Pro Ile Leu Glu Asp Ala Pro
 Page 8

1220		1225		1230
Gly Leu 1235	Gln Pro Gln Ala	Glu 1240	Gly Ser Gln Glu	Ala Ser Trp Gly 1245
Val Gln 1250	Gly Arg Ala Glu	Ala 1255	Gly Lys Val Glu	Ser Glu Gln Glu 1260
Glu Leu 1265	Gly Ser Gly Glu	Ile 1270	Pro Glu Gly Leu	Gln Glu Glu Gly 1275
Glu Glu 1280	Ser Arg Glu Glu	Ser 1285	Glu Glu Asp Glu	Leu Gly Glu Thr 1290
Leu Pro 1295	Asp Ser Thr Pro	Leu 1300	Gly Phe Tyr Leu	Arg Ser Pro Thr 1305
Ser Pro 1310	Arg Trp Thr Pro	Leu 1315	Glu Ser Arg Gly	His Pro Leu Lys 1320
Glu Thr 1325	Gly Lys Glu Gly	Trp 1330	Asp Pro Ala Val	Leu Ala Ser Glu 1335
Gly Leu 1340	Glu Glu Pro Ser	Glu 1345	Lys Glu Glu Gly	Glu Glu Gly Glu 1350
Glu Glu 1355	Cys Gly Arg Asp	Ser 1360	Asp Leu Ser Glu	Glu Phe Glu Asp 1365
Leu Gly 1370	Thr Glu Ala Pro	Phe 1375	Leu Pro Gly Val	Pro Gly Glu Val 1380
Ala Glu 1385	Pro Leu Gly Gln	Val 1390	Pro Gln Leu Leu	Leu Asp Pro Ala 1395
Ala Trp 1400	Asp Arg Asp Gly	Glu 1405	Ser Asp Gly Phe	Ala Asp Glu Glu 1410
Glu Ser 1415	Gly Glu Glu Gly	Glu 1420	Glu Asp Gln Glu	Glu Gly Arg Glu 1425
Pro Gly 1430	Ala Gly Arg Trp	Gly 1435	Pro Gly Ser Ser	Val Gly Ser Leu 1440
Gln Ala 1445	Leu Ser Ser Ser	Gln 1450	Arg Gly Glu Phe	Leu Glu Ser Asp 1455
Ser Val	Ser Val Ser Val Pro	Trp Asp Asp Ser	Leu Arg Gly Ala	

1460		1465		1470
Val	Ala	Gly	Ala	Pro
1475				Lys
		Thr	Ala	Leu
		1480		Glu
			Thr	1485
			Glu	Ser
			Gln	Asp
Ser	Ala	Glu	Pro	Ser
1490				Gly
		Ser	Glu	Glu
		1495		Glu
			Ser	Asp
				1500
			Pro	Val
			Ser	
Leu	Glu	Arg	Glu	Asp
1505				Lys
		Val	Pro	Gly
		1510		Pro
			Leu	Glu
				1515
			Ile	Pro
			Ser	
Gly	Met	Glu	Asp	Ala
1520				Gly
		Pro	Gly	Ala
		1525		Asp
			Ile	1530
			Ile	Gly
			Val	Asn
Gly	Gln	Gly	Pro	Asn
1535				Leu
		Glu	Gly	Lys
		1540		Ser
			Gln	His
				1545
			Val	Asn
			Gly	
Gly	Val	Met	Asn	Gly
1550				Leu
		Glu	Gln	Ser
		1555		Glu
			Glu	Glu
			Ser	1560
			Gly	Ala
			Arg	
Asn	Ala	Leu	Val	Ser
1565				Glu
		Gly	Asp	Arg
		1570		Gly
			Ser	Pro
				1575
			Phe	Gln
			Glu	
Glu	Glu	Gly	Ser	Ala
1580				Leu
		Lys	Arg	Ser
		1585		Ser
			Ala	Gly
				1590
			Ala	Pro
			Val	
His	Leu	Gly	Gln	Gly
1595				Gln
		Phe	Leu	Lys
		1600		Phe
			Thr	Gln
				1605
			Arg	Glu
			Gly	
Asp	Arg	Glu	Ser	Trp
1610				Ser
				1615
			Gly	Glu
			Asp	

<210> 3
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer

<400> 3
 gcggggcggt gcgtgactac

20

<210> 4
 <211> 24
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer

<400> 4

aggcaagggg gaagagaagg atgt 24

<210> 5
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 5
aagctgaagc cgaatttcct tgggatacca gagga 35

<210> 6
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 6
acagccagta cttcaagacc 20

<210> 7
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 7
ctgtgtcagc acgcacgtta 20

<210> 8
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 8
tggattccac accaggcatt gaccatgccca 30

<210> 9
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 9
cagcgttgga gagtccaaat 20

<210> 10

<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 10
ttaaactcct gtggggttgg 20

<210> 11
<211> 37
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 11
aaaccagcag cggatctcag tgggtgtggaa cgatgat 37

<210> 12
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 12
atcactggag caggaagt 19

<210> 13
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 13
gctactacgt ttcttatct 19

<210> 14
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 14
gcgtggaaaa gccagtggg 19

<210> 15
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
 <223> Primer
 <400> 15
 agaggggaat tcctggag 18

<210> 16
 <211> 20
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 16
 ctgaggacca ggactctcta 20

<210> 17
 <211> 31
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 17
 tatgaacggg ctggagcagt ctgaggaaag t 31

<210> 18
 <211> 20
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 18
 cttttcgcgc gccacgatt 20

<210> 19
 <211> 20
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 19
 gatcttcctg tccctcgagc 20

<210> 20
 <211> 30
 <212> DNA
 <213> Artificial Sequence .
 <220>
 <223> Primer
 <400> 20

aaccatgagg aggaaatcag tacgctgagg 30

<210> 21
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 21
atctggactc caggcgtgcc 20

<210> 22
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 22
agcaatgaat tccttggcag 20

<210> 23
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 23
cacgatgaat ttgagagaca tgctgaaggg 30

<210> 24
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 24
agaacagcac gtacacagcc 20

<210> 25
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 25
cctccgaaga aacagcaaga 20

<210> 26

<211> 30
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 26
 tctcccttca cagcagaact aacacacggg 30

<210> 27
 <211> 20
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 27
 gcagtcctgc catcaatgtg 20

<210> 28
 <211> 20
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 28
 gttggctgtg aataccacct 20

<210> 29
 <211> 30
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 29
 ctggagagct gcatgggctc acaactgagg 30

<210> 30
 <211> 20
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> Primer
 <400> 30
 gactttccag cagtcccata 20

<210> 31
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 31
 gtttacttcc tgcaggggaac 20

<210> 32
 <211> 31
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 32
 ttgcactgga gaaggattac gtggcggttct a 31

<210> 33
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 33
 tgaaggcgag aaggtgttcc 20

<210> 34
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 34
 ttcgagatac aggcagatat 20

<210> 35
 <211> 30
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 35
 agttagactt ttatgtcctg cctgtgctca 30

<210> 36
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 36

cttcaggctg caccaagtgt 20

<210> 37
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 37
gttgaccata gtcaggctgg 20

<210> 38
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 38
gtcagatgtg aagatggcca cagacccaga 30

<210> 39
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 39
gcatcaaatg tcagccctgg 20

<210> 40
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 40
caacgctgac atggaattcc 20

<210> 41
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 41
tcgaggtctc atggatcata cagaatcagg 30

<210> 42

<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 42
caatgtgaga tgtctccagc 20

<210> 43
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 43
ccttgtagat tgcaggcaga 20

<210> 44
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 44
ggactcccat ccagtgtctc cagaagtgat 30

<210> 45
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 45
gagtagcagc tcagactgcc 20

<210> 46
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 46
gtagacctct gggagctcct 20

<210> 47
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
 <223> Primer
 <400> 47
 cgcagcactc agactacgtg cacctctgca 30

<210> 48
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 48
 gcagctgctc aactaatcac 20

<210> 49
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 49
 tcagcagcac aagtcccact 20

<210> 50
 <211> 30
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 50
 acgggcattc ttattagtca gattattggt 30

<210> 51
 <211> 16
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 51
 aggcttcttc tacaca 16

<210> 52
 <211> 16
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer
 <400> 52

caggctgcct gcacca

16

<210> 53
<211> 16
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 53
aggcagagga cctgca

16

<210> 54
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> Primer

<400> 54

Cys Phe Ile Ala Trp Leu Val Lys Gly Arg
1 5 10

<210> 55
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 55
gggtggtgag gggtgaggtt tgtg

24